

**ABSTRACT**

A combination of a metal-based catalyst having a function as a catalyst for formation of graphite and a single-crystal substrate having a certain correspondence to the metal-based catalyst with respect to the crystal grain size and the crystal orientation thereof is used; the metal-based catalyst is dispersed on the single-crystal substrate; and a carbon material is fed to the substrate at any temperature not lower than 500°C to thereby form single single-walled carbon nanotubes through vapor phase thermal decomposition growth on the substrate. More precisely, the invention of this application enables production of single-walled carbon nanotubes with controlled diameter, requiring neither a porous material nor catalyst particles for use as a catalyst carrier. One example of the combination of the metal-based catalyst and the single-crystal substrate is a combination of Fe and sapphire substrate.